

LOS ALAMOS NATIONAL LABORATORY

SITE PROFILE

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**Office of Oversight
Environment, Safety and Health
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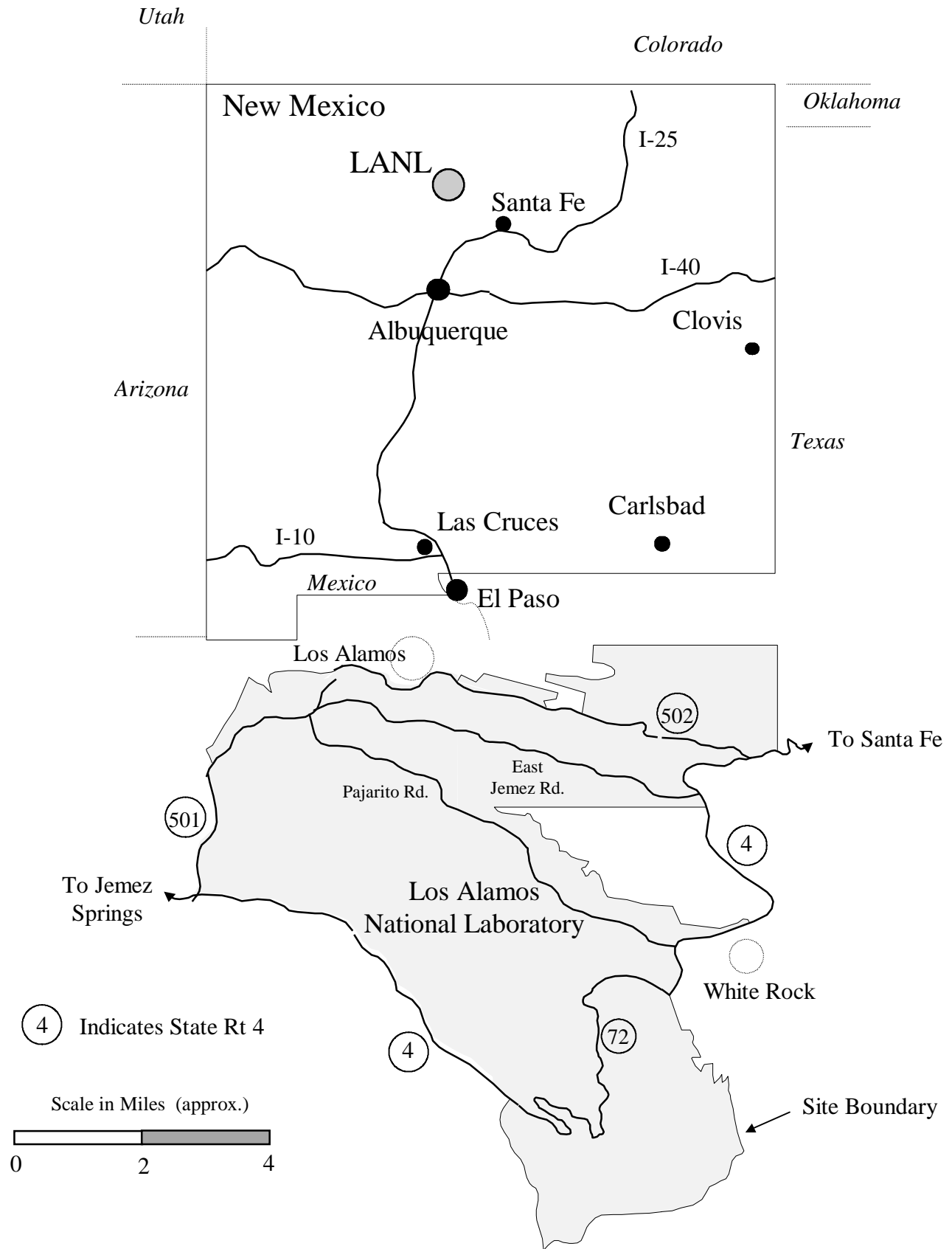
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Site profiles provide information on Department of Energy sites, including background; major environment, safety, and health initiatives and activities; items for management attention; and performance.

The electronic version of this site profile and other Office of Oversight documents referenced in this document can be accessed through the Internet at **<http://www.tis.eh.doe.gov/oversight/bookcase2.html>**.

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Los Alamos National Laboratory Site Map

LOS ALAMOS NATIONAL LABORATORY

BACKGROUND

Description

Los Alamos National Laboratory (LANL), established in 1943, occupies approximately 43 square miles of Department of Energy (DOE) land situated on the Pajarito plateau in the Jemez Mountains of northern New Mexico. The closest population centers are the communities of Los Alamos, population approximately 12,000, and White Rock, population approximately 8,000. The closest large metropolitan center is Santa Fe, population approximately 50,000, located 35 miles away.

LANL currently consists of Technical Areas (TAs), of which 49 are actively in use. Facilities within these areas include: a reactor (which is shut down); criticality experiment areas; particle, neutron, and ion accelerators; sealed source and x-ray radiography facilities; research laboratories; depleted uranium and explosive test facilities; plutonium recovery, metal production, and metal fabrication facilities; radiologically and/or chemically contaminated environment areas in various stages of remediation; and decontamination and decommissioning projects.

The site's key facilities are described in Appendix A. Each facility's description includes its mission/status, hazard classification/authorization basis, worst-case design basis accident, and principal hazards and vulnerabilities. For the purpose of the profile, a key facility is a facility, building, or complex that is significant from an environment, safety, or health perspective.

Mission

LANL lists its mission as applying science and engineering capabilities to problems of national security. As technologies, U.S. priorities, and the world community have changed, LANL's

original mission has broadened and evolved from the primary task of designing nuclear weapons to include non-nuclear defense programs and a broad array of non-defense programs and basic science. The Laboratory's central mission is reducing the danger of nuclear weapons and nuclear materials worldwide, and consists of the following five areas: (1) stockpile stewardship, (2) stockpile management, (3) nuclear materials management, (4) non-proliferation and counterproliferation, and (5) environmental stewardship. The basic science aspect of the Laboratory includes fundamental research into neutrinos and spallation, and fundamental research in the biological sciences, with initiatives in chemical, biological, and radiological deterrents. LANL conducts extensive research in energy, nuclear safeguards and security, biomedical science, computational science, environmental protection and cleanup, materials science, and other basic research. LANL is also continuing to direct its capabilities toward helping U.S. industry become more competitive internationally.

Management

LANL is managed by the regents of the University of California (UC) pursuant to a management and operating contract with DOE. The Los Alamos Area Office (LAAO), a part of the Albuquerque Operations Office (AL), administers the contract with UC and oversees contractor operations at the site. LANL was originally founded and established as Project Y of the Manhattan Project. UC has managed the Laboratory since its inception in 1943. In staff and technical capabilities, LANL is one of the largest multidisciplinary, multiprogram laboratories in the world.

A five-year extension of the contract for UC to manage and operate LANL, signed October 1, 1997, embodies the objectives of the DOE contract reform initiative, including greater use of results-oriented performance measures and

results-based payment. The five-year extension requires greater contractor accountability for performance, including: a fee structure based on performance; more liability for performance failures; and special provisions for the management of environment, safety, and health (ES&H) as well as economic development and diversification issues in northern New Mexico. The contract includes provisions for terminating the contract for failure to produce in accordance with DOE expectations in specified performance

measures related to ES&H improvements; environmental restoration and waste management; and regional community involvement. These provisions, collectively referred to as the “off ramp,” include formal performance assessments to be conducted at the end of the first and second years of the contract.

Major Federal and contractor support subcontractors at LANL are shown in Table 1.

Table 1. Subcontractors at LANL

Organization	Responsibilities
Protection Technology Los Alamos (PTLA)	Security force
Johnson Controls Northern New Mexico, LLC (JCNNM)	Maintenance services
The Plus Group	Secretarial services
Butler, Weirich, Comforce	ES&H and technical support
County of Los Alamos Fire Department	Fire protection, ambulance, and emergency medical services

LANL has approximately 8,055 full-time equivalent personnel, of whom 700 are in the Environment, Safety and Health (ESH) Division. There are also 75 DOE and support contractor personnel assigned to LAAO. Fifteen different labor unions represent personnel who work for subcontractors to UC at the site. The support services subcontracts utilize a performance-based fee program consistent with the contract reform initiatives to achieve significant performance improvements.

The Office of Defense Programs (DP) is the LANL lead program secretarial office and site landlord. A number of other offices have programmatic interests at LANL, as listed in Table 2. DP and the Offices of Nonproliferation and National Security (NN) and Environmental Management (EM) have interests in national security and environmental programs. The Office of Science (SC) and the Office of Nuclear Energy, Science and Technology (NE) have

interests in LANL’s science and technology programs.

The County of Los Alamos provides 24-hour fire protection services to LANL through an agreement with LANL. The Los Alamos Fire Department (LAFD) operates five strategically located fire stations and one training facility, and staffs each fire station with three operating shifts. Fire protection services include fire fighting, emergency preparedness support, emergency medical service, light rescue, and hazardous materials response support. The LAFD employs approximately 118 personnel, most of whom are uniformed shift personnel. The current staff holds specialized and professional fire protection/safety certificates and licenses and includes certified emergency medical technicians, some of whom are also qualified to administer advanced cardiac medications.

Table 2. Major DOE Program Funding (In Thousands)

Organization	FY 1999 Adjusted	FY 2000 Request
Assistant Secretary for Defense Programs (DP)	\$883,529	\$908,763
Assistant Secretary for Environmental Management (EM)	87,963	113,087
Office of Nonproliferation and National Security (NN)	125,263	137,707
Office of Science (SC)	72,977	70,520
Office of Fissile Materials Disposition (MD)	35,035	36,768
Office of Nuclear Energy, Science and Technology (NE)	17,512	19,435
Assistant Secretary for Energy Efficiency and Renewable Energy (EE)	15,387	16,939
Assistant Secretary for Fossil Energy (FE)	1,400	1,150
Assistant Secretary for Environment, Safety and Health (EH)	270	270
Office of Civilian Radioactive Waste Management (RW)	12,536	11,204
Office of Inspector General (IG)	616	662
Total	\$1,252,488	\$1,315,875

Budget

The information appearing in this section has been gathered from a number of sources, including the most recent Congressional budget request and knowledgeable individuals from the respective Headquarters organizations and/or sites; it represents the best available budget information at the time of profile publication. It should be noted that budget information is dynamic, depending on the point in the budget cycle at which it is obtained. This information is included to provide the reader with a sense of the magnitude and sources of the budget for this site. It is not intended to be the definitive source of budget information.

LANL receives most of its annual budget from DOE. Some additional funding is received from the Department of Defense, the National Aeronautics and Space Administration, and private-sector research and development. The operating budget for the LANL site is approximately \$1.2 billion for fiscal year (FY) 1999. The FY 2000 budget request is \$1.3 billion as shown in Table 2.

Beginning in FY 1998, DP funding for nuclear facility operations and maintenance was budgeted

primarily in the stockpile stewardship and management accounts to provide programmatic stability. Also, in FY 1999, the funding for waste management was returned to DP as the responsible waste generator, while the cleanup of legacy waste remained an EM responsibility.

Significant Commitments to Stakeholders

Los Alamos County

DOE no longer makes assistance payments to the County under the Atomic Energy Community Act of 1955. The County is now eligible for Payments in Lieu of Taxes (PILT) under the Atomic Energy Act of 1954. Also, DOE is negotiating the transfer of ten tracts of Federal land (approximately 4700 acres) to the County and the Pueblo of San Ildefonso that are no longer needed for the national security mission at LANL and that can be cleaned up within the next ten years. The County and DOE, pursuant to an electric coordination agreement, pool electric power that is furnished to LANL and the community. The County leases DOE's water production system and now supplies water to the community and to LANL. In addition, the County operates a municipal landfill on DOE-controlled land that is used by LANL.

Los Alamos Schools

DOE has ended assistance payments to the Los Alamos Public Schools under the Atomic Energy Community Act of 1955. However, DOE has continued to make payments to the schools under the DOE Organization Act to make up for the higher cost of living in Los Alamos. DOE is also funding the creation of a trust that will be used to provide educational enrichment activities throughout northern New Mexico, including Los Alamos County. DOE is working with the LANL Foundation to establish this trust, which is being funded by payments from the LANL operating budget as well as direct contributions by DOE.

Regional Development Corporation (RDC)

The RDC, established in July 1996 as a not-for-profit organization, was recognized by DOE as the Community Reuse Organization to administer transition funds from DOE for northern New Mexico community transition. The RDC serves as a resource for communities with the need to diversify their local economies and to define an economic future less dependent on Federal funding.

Native Americans

DOE issued an American Indian Policy in November 1991 to provide guidance to maintain effective working relationships with tribes for lands and rights of Native Americans affected by DOE actions. DOE and the Laboratory entered into Accords and Cooperative Agreements with four pueblos near Los Alamos, committing to government-to-government and cooperative relations with these pueblos. Annual executive-level meetings are held with the same four pueblos, and similar annual meetings are held with the Eight Northern Indian Pueblos Council. Issues addressed with the tribes are predominantly related to environment, safety, and health. The tribes are also interested in education, employment, and economic benefits related to the presence of the Laboratory.

State of New Mexico Environment Department

New Mexico citizens are represented by the Environment Department's DOE Oversight Bureau, which maintains a small staff on site at LANL. This bureau performs environmental monitoring of air, water, soil, foodstuffs, and game, as well as reviews of National Environmental Policy Act (NEPA) documentation and environmental restoration activities.

Natural Resource Trustee Council

Pursuant to the "public trust doctrine" within several environmental laws, stakeholder trustees for natural resources may recover damages for injury to, destruction of, or loss of natural resources resulting from the release of a hazardous substance or the discharge of oil. The "public trust doctrine" provides, in general, that governments hold certain property and natural resources in trust for the benefit of the public and, furthermore, have the duty and authority to protect and preserve such property and resources for public use. At LANL, such government stakeholders are represented on the LANL Natural Resource Trustee Council and act on behalf of the public as trustees for natural resources under the applicable Federal laws and regulations.

A memorandum of agreement (MOA) establishes the Council as the collaborative working group that oversees and coordinates all Trustee activities. Trustees signing the MOA are the U.S. Department of Energy, the U.S. Department of Interior, the U.S. Department of Agriculture Forest Service, the Pueblo de Cochita, the Pueblo of Jemez, the Pueblo of San Ildefonso, the Pueblo of Santa Clara, and the State of New Mexico. Through its member Trustees, the Council may conduct cooperative assessments and restoration of natural resources. The Council primarily relies on, and provides input and guidance to, the Department's environmental restoration project at LANL. Its primary purpose is to determine whether and to what extent natural resources have been injured as a result of releases from the

Laboratory. The Council develops and participates in cleanup actions designed to return resources and their services to baseline conditions, or to provide for compensation for lost services pursuant to statutory authority.

Defense Nuclear Facilities Safety Board (DNFSB) Recommendations

DNFSB recommendations specific to LANL are identified in Table 3.

Table 3. DNFSB Recommendations Specific to LANL

DNFSB Recommendation	Subject	Status:
<i>94-1, Improved Schedules for Remediation of the Defense Nuclear Fuels Complex (SNM Stabilization)</i>	Repackaging plutonium metal and/or elimination of hazards; processing containers of possibly unstable residues; and converting constituent plutonium to a form suitable for safe interim storage.	As of September 1998, high-risk legacy vault items were stabilized, and plutonium was recovered as oxide. The plan for completing the stabilization of remaining legacy items was revised and the schedule extended; metal and oxide are to be inspected and repackaged by September 2003 (16-month delay), and residues are to be stabilized and plutonium is to be recovered as oxide by September 2005 (40-month delay). Intermediate milestones were set. In a letter dated December 14, 1999, the DNFSB warned that the revised plan does not reflect current planning for excess plutonium or material received from Mound.
<i>94-2, Low-Level Waste Disposal</i>	Comprehensive review of low-level wastes disposed of at LANL through use of shallow land burial.	Site submitted performance assessment to DOE for approval in December 1997. EM has completed its review and approval actions; EM is awaiting authorization to proceed.
<i>97-2, Continuation of Criticality Safety</i>	Concern about loss of technical and practical experience with criticality experiments. Sharing of criticality calculations and ultimately a qualification program for criticality engineers.	DOE submitted implementation plan on December 12, 1997; 27 of 30 planned milestones/deliverables have been completed. The Criticality Safety Support Group (CSSG) was formed to help resolve any criticality safety issues. Available records were archived and a database was established. Los Alamos Critical Experiments Facility (LACEF) procedures, software, and safety systems were reviewed. EM is to fully support criticality safety activities but depends on Congressional funding action. CSSG performed an annual review of nuclear criticality safety program in March 1999. Criticality safety training resumed at LANL in mid-1999, including expanded/advanced material. Experimental activities also resumed at LACEF in mid-1999.

MAJOR ENVIRONMENT, SAFETY, AND HEALTH INITIATIVES/ACTIVITIES

Integrated Safety Management

The original integrated safety management (ISM) plan for the LANL site (approved December 3, 1996) was updated and approved by DOE line management (AL/LAAO) in September 1999. UC/LANL is required to fully implement the ISM plan; aggressively pursue the support of all senior managers for formality of operations as

defined by ISM; and make ISM a key evaluation factor in determining the performance of the Laboratory director and other senior managers. The ISM plan is the cornerstone of the Laboratory's ES&H program and is a major element of the LANL contract. The ISM plan encompasses many of the corrective actions that were developed to address systemic areas of weakness identified in Office of Oversight accident investigation reports and ES&H management evaluations. The Operations Working Group (OWG) is the Laboratory's primary advisory and oversight organization for

operations (including ES&H) and is charged with establishing and maintaining the ISM system. The OWG is composed of senior LANL managers, the ISM program manager, and representatives from LAAO, UC, and major subcontractors. The ISM program manager is responsible for guiding and tracking the institutional implementation and sustained execution of ISM.

The basis of ISM is safety standards, and at LANL, the September 23, 1999, Work Smart standards (WSS) are being used to establish the contractual basis for authorizing work. LAAO monitors the execution of these safety standards as well as their implementation within the ISM system through a joint AL/LAAO and UC/LANL ISM Change Control Board (CCB). The CCB serves as the WSS Convened Group to review and process proposed changes to the WSS and the ISM implementation plan. Changes that have been incorporated into the ISM plan include the configuration management control program, the electrical safety program, the training and qualification of facility managers and senior technical managers, and the phased implementation of requirements.

LANL reports that it is basically on track in developing the plans and implementation guidance for ISM. Translation of standards into a Laboratory-wide system for performance and requirements is an ongoing process that was originally scheduled for completion by the end of 1998 but is now expected sometime in 2000. To date, overall progress against the revised ISM implementation schedules has been satisfactory. Ongoing ISM activities have focused on two areas: (1) completing the milestones that constitute the ISM implementation plan, and (2) engaging the workforce in its ISM efforts. LANL management reports that LANL is on or slightly ahead of schedule in completing the more than 200 discrete actions in the ISM implementation plan.

In November 1999, an Office of Oversight follow-up review found that LANL had established fundamental systems to support the

implementation of ISM across the Laboratory. Improvements were still needed in some areas, however, to effectively implement key ISM initiatives, such as safe work practices and facility safety plans at the division level. For example, LANSCE management has made good progress since an earlier Oversight review (January 1998) and has several initiatives under way to further improve ES&H systems and fully implement ISM. LANSCE management now has a good understanding of current weaknesses and has efforts in place to make the needed improvements.

The Phase I and Phase II verification of the LANL ISM system was completed in October 1999. The final report is in preparation and will show Phase I as implemented. Phase II is implemented except in two areas which will be reassessed in the summer of 2000.

Radioactive Liquid Waste Treatment Facility (RLWTF) Upgrades

The original RLWTF was designed in the early 1960s for radionuclide removal. The facility's current effluent does not routinely meet all of the New Mexico Water Quality Control Commission (NMWQCC) groundwater standards adopted in 1977. National Pollutant Discharge Elimination System (NPDES) compliance and facility operational data have indicated that the treated effluent consistently exceeded NMWQCC groundwater standards for fluoride and nitrate. DOE Order 5400.5 regulates the discharge of radioactive constituents from permitted outfalls into the Mortandad Canyon. Six radionuclides (Sr-90, Cs-137, Pu-238, Pu-239, Pu-240, and Am-241) have exceeded their respective derived concentration guideline values in the RLWTF effluent during at least parts of calendar years 1990 through 1997.

In late 1997, after evaluation of alternatives for management of treatment of radioactive liquid waste, LANL undertook a five-phase upgrade program for RLWTF. Phase I involved installation of additional treatment process

equipment for tubular ultrafiltration followed by reverse osmosis (RO). Phase II involved the addition of biological denitrification equipment to remove nitrates in the RO concentrate stream to below NMWQCC groundwater standards. Phase III will involve source identification and minimization of radioactive liquid waste. Phase IV is to involve the further evaporation of RO concentrate to allow its reuse in the facility. The goal of Phase V is the ultimate elimination of all discharges of treated liquid waste to the environment through treatment of radioactive wastewater to near drinking-water quality and its reuse in industrial processes or its disposal by evaporation.

Equipment installation under Phases I and II has been completed. A readiness assessment performed in late 1998 generated 12 pre-start and ten post-start findings. The pre-start findings were closed at the end of March 1999, and Phase I and II equipment is operational. Phase III upgrades are under way and should be completed in early FY 2000. Phase IV upgrades are scheduled to be completed by June 2000, but no completion date has been set for the Phase V work.

Plutonium Vulnerability Management

The DOE plutonium vulnerability study issued in November 1994 identified 60 deficiencies for LANL that are being tracked to closure by the Nuclear Materials Stabilization Task Group at DOE Headquarters through the Plutonium Vulnerability Management Plan (DOE-EM-0199) in accordance with DNSFB Recommendation 94-1. The most significant vulnerabilities at LANL include: a storage area in TA-55 that contains about 1,000 metal containers of highly corrosive sodium, potassium, and magnesium salts; about 300 containers of plutonium metal that are prone to rupture from metal oxidation; 32 plutonium-contaminated vessels at TA-55; and onsite shipping of gram quantities of plutonium in solutions in unapproved containers. LANL set a goal of stabilizing all high-risk items in the TA-55 storage area by the end of 1997, which was

within DOE's three-year time limit. To date, LANL reports that 45 of the 60 vulnerability issues have been resolved, and the other 15 are being evaluated for closure or remediation. Of the original legacy inventory covered by DNSFB Recommendation 94-1, approximately half of the plutonium-containing items have been stabilized, including the original high-risk inventories. The December 1998 revision of the 94-1 implementation plan now has LANL completing the stabilization of the legacy inventory by 2005, a milestone slippage of three years over the originally planned deadline. This slippage was mutually agreed upon based on progress made and the changing mission requirements for the use of such materials at LANL. In addition, the goal of stabilizing only the legacy inventory has evolved into an integrated program to stabilize and process the entire material scrap inventory at TA-55 and to return the storage area to a "day-use" condition by 2012, where no item remains in storage for more than three years. Meeting these milestones depends on dedicated, adequate, and consistent funding.

Decontamination and Decommissioning

The High Pressure Tritium Facility, Building 86 at TA-33, is slated for decommissioning and demolition during the FY 2000-2002 period. This will include the removal of all electrical, mechanical, and structural systems; disposal of wastes; and site restoration. Significant radioactive contamination is expected in the tritium processing areas (Rooms 9 and 12) and inside the 75-foot exhaust stack.

TA-21 is the former Los Alamos facility for uranium and plutonium processing. The site contains 81 structures that will be decommissioned and demolished during the FY 2000-2008 period. Known contaminants include radiological and hazardous materials, asbestos, and polychlorinated biphenyls (PCBs). The decontamination and decommissioning (D&D) work will be coordinated with the remedial action removal of underground material disposal areas and remediation of soil contamination.

The TA-2 Omega West Reactor Facility contains 24 structures that will be decommissioned and demolished during the FY 2000-2008 period. This facility was used for a number of research reactors, and it is significantly contaminated with radiological material.

The Scyllac (TA-3-287) and Sherwood (TA-2-105) buildings are slated for decommissioning and demolition during the FY 2000-2006 period. These buildings were previously used for controlled thermonuclear reaction research, but they were cleaned up and converted to office and storage space. Because of their location, removal is vital to the strategic core revitalization planning.

Approximately 30 other miscellaneous structures are slated for decommissioning and demolition during the FY 2000-2008 period. These structures include concrete bunkers, guard stations, storage magazines, and older wooden laboratory buildings. The contaminants include high-explosives residue and radiological, asbestos, and hazardous material.

The D&D Group has assumed facility management responsibilities for surplus facilities that are transferred from the using organizations. Their responsibilities include maintaining the safety envelope, providing for surveillance and maintenance, and planning for future decommissioning.

Hydrogeologic Workplan

The Hydrogeologic Workplan describes the activities to be performed by the Laboratory to characterize the hydrogeologic setting beneath the Laboratory and to enhance the Laboratory's groundwater monitoring program. The Workplan addresses specific regulatory concerns expressed by the New Mexico Environment Department (NMED) regarding hydrogeologic characterization of the subsurface and groundwater monitoring. The planned activities under the Workplan include development of a conceptual model of the subsurface, development of an information management system,

development of a numerical groundwater flow model, and installation of 32 characterization and monitoring wells to the deep aquifer. These wells are being installed under a joint project sponsored by DP and ER. The fourth deep well of the proposed 32 was completed; installation of each of the remaining wells will be accomplished in coordination with NMED. The expected outcomes of implementing the Hydrogeologic Workplan include: (1) an improved understanding of the hydrogeology beneath the Laboratory, including groundwater recharge and movement; (2) an improved groundwater monitoring program, with additional wells as required; and (3) identification of existing or potential locations of groundwater contamination, potential pathways, rate of movement, and subsequent risk to human health and the environment. Workplan activities are reviewed quarterly with the NMED, and the Workplan is adjusted annually based upon any new hydrogeologic information that becomes available.

ENVIRONMENT, SAFETY, AND HEALTH ITEMS FOR MANAGEMENT ATTENTION

This section identifies topics of concern to the Office of Oversight related to LANL ES&H programs and their implementation. The ES&H items discussed below resulted from the Office of Oversight assessments.

During the period August to October 1996, the Office of Oversight conducted a comprehensive safety management evaluation of LANL. The evaluation concluded that although initiatives were under way, the safety management program at LANL was not achieving the desired level of performance. At that time, weaknesses were identified in the implementation of many ES&H programs, most notably work planning and control, conduct of operations, maintenance, and electrical safety. In January 1998, the Office of Oversight conducted a follow-up review of the status of implementation of corrective actions resulting from the DOE Type A accident

investigations conducted at LANL in 1995 and 1996. A second follow-up review, completed in November 1999, focused on LANSCE research and development (R&D) operations and the deficiencies cited in the report of the July 1996 microwave accident investigation, and also examined progress on key ISM initiatives identified in the January 1998 review. The reviews covered many of the same deficiencies described below and the results of the reviews are reflected in the discussions of action status.

The statement of the concern as previously reported is shown in *italics*; supporting statements are included, as well as the status of recent related actions taken at LANL. Items that reflect safety issues identified in Office of Oversight safety management evaluation reports have been entered into the DOE Corrective Action Tracking System (CATS). Corrective action plans responding to these issues are developed by line management and reviewed by the Office of Oversight in accordance with the DOE guidance provided by DOE Order 414.1A and the Safety Management Functions, Responsibilities, and Authorities Manual (DOE Manual 411.1-1A). The status of site corrective actions for identified Oversight safety issues can be found at the Web site for CATS at <http://tis.eh.doe.gov/portal/catsentry.html>. The Office of Oversight monitors the status of corrective actions and will assess, through scheduled follow-up reviews, progress against site plans and milestones, effectiveness of reported implementing activities, and adequacy of reported completions.

Roles, Responsibilities, and Authorities

The 1996 Oversight safety management evaluation found that site roles and responsibilities were generally defined for senior DOE and LANL managers; however, they become more ambiguous at lower tiers of the organization, especially at the subcontractor level. DOE roles, responsibilities, and authorities from DOE/DP Headquarters to AL and LAAO were not well defined or understood for organizations and associated personnel,

especially for authorization basis review and approval authority, oversight, and technical assistance functions. Efforts to clarify inter- and intra-organizational interfaces either were never finalized or were in the process of being redefined. While roles, responsibilities, and authorities (RRAs) were defined for LANL senior managers, they were less well defined at lower tiers of the organization, especially at the subcontractor level. RRAs were also not well defined for interfaces between the facility manager, the ES&H and Facilities, Safeguards and Security support organizations, and the “tenant” organizations. Formal definition and associated documentation of RRAs had not kept pace with LANL organizational and functional changes and new initiatives, resulting in inconsistent interpretation of interfaces and considerable variation in delineation and understanding of responsibilities among facilities and organizations.

Action Status

AL and LAAO report that corrective actions for this safety issue have been completed.

At LANL, roles and responsibilities (R&R) for safety are defined in detail in the ISM system description, dated November 1996, in section I.B, and in LAUR-98-2837, Rev. 2 and Rev.3, Section 3. The ISM document first addresses R&R determined by the individual’s position in the line-management chain responsible for safety and environmental protection, while the second part covers organizational roles and related authorities and responsibilities. The requirements for ES&H responsibility described in the ISM document apply to the entire workforce and to all areas of worker, public, and environmental protection. The workforce comprises all Laboratory workers employed by UC, all of its onsite subcontractors, and official visitors.

Each senior manager sent a letter to the Laboratory Director on or about November 1997 committing to the implementation and maintenance of a safety-responsible line

management chain in their organization consistent with the requirement in the ISM description. These letters are on file in the ISM Program Office. This is also an “off-ramp” issue and was accepted as complete by LAAO on December 12, 1998.

AL designed and implemented a Safety Management Functions, Responsibilities, and Authorities (FRA) computerized database system that contains specific responsibilities and authorities for safety management functions. The AL FRA, Revision 2, database was submitted to DP on October 30, 1998, along with a manual describing how the database functions. The AL FRA database was the result of a coordinated effort to ensure that roles and responsibilities for safety management functions at AL were identified, documented, and revised as necessary.

On August 21, 1995, DP provided a document on “Implementation Guidance for Authorization Basis” that defined roles and responsibilities of Headquarters and field elements in approving the authorization basis. DP provided more specific instructions on roles and responsibilities in a February 24, 1996, memo to the operations offices. These guidance documents were used in developing the AL Functions, Assignments, and Responsibilities (FAR) Manual.

A memo was sent to all the appropriate AL divisions on July 26, 1996 requesting that a division point-of-contact be assigned and responsibility matrices completed to initiate the AR effort. As work continued, the name of the effort was changed from FAR to the current FRA. A memo was sent to cognizant AL divisions on November 6, 1996, to request further information delineating responsibilities between organizations. The AL FRA, Revision 1, was sent to AL divisions and area offices on February 11, 1998, for their review. The FRA was essentially complete at this time except for the continuing update of the database. On February 27, 1998, the AL FRA, Revision 1, was approved by the AL Manager and was sent to DP for their informal evaluation. The approved Revision 1 of the AL FRA was

distributed to area offices and cognizant AL divisions on March 19, 1998. In September 1998, a meeting was held in Albuquerque to coordinate FRA manuals from all of the DOE sites. After this coordination meeting, the AL FRA was revised. The AL FRA effort was completed and Revision 2 of the AL FRA database was forwarded to DOE Headquarters on October 30, 1998. The AL FRA (a “living” document) requires periodic update to ensure the currency of responsibilities, authorities, and organizational changes. However, the AL FRA effort addresses the concern, and the issue is considered closed.

In addition, the DOE AL Manager delegated approval authority for unreviewed safety questions (USQ) and justifications for continued operations to LAAO. This memo, dated June 23, 1997, stated that LAAO has full responsibility and accountability for successfully conducting the USQ program at the site. The USQ program was established to provide contractors operational flexibility while also preserving the DOE authorization basis for nuclear facilities and operations. LAAO appointed a Senior Authorization Basis Manager in September 1998 to oversee the LANL authorization basis (AB) program. The Senior Authorization Basis Manager is still in this position at LAAO.

Planning and Control of Work Activities

The 1996 Oversight evaluation found that there were no sitewide policies for planning and control of work activities. The hazards analysis process in support of work planning was not consistent among facilities and contractors, did not integrate workers into the work planning and control process, and was not proceduralized for sitewide use to adequately address the authorization of work, keeping work within the analyzed and authorized scope, and use of and adherence to procedures. Efforts to implement a work planning and control process, such as development of facility management standards, lacked sufficient detail to thoroughly define the final process.

Action Status

AL and LAAO report that corrective actions for this safety issue have been completed.

To improve the planning and work control activities at LANL, Laboratory Implementing Requirement (LIR)-230-03-01.5, "Facility Management Work Control," was issued and revised several times (Revision 5 issued July 1, 1999). The F-9 and ESH organizations have conducted self-assessments of the work control process at all Facility Management Units on a quarterly basis. These self-assessments covered the five core functions of ISM. The results of these assessments were given to the Facility Management Council, which has made recommendations to improve the work control process. The results of these self-assessments were also provided to AL for their upcoming assessment on the work-control LIR. Also, configuration management is being implemented in accordance with an ISM Change Control Board-approved schedule dated June 16, 1998. The LIR for safe work practices, LIR-300-00-01.0, was validated by AL and LAAO in April 1999.

Conduct of Operations/Use of and Adherence to Procedures

Office of Oversight reviews in 1996 determined that LANL senior management had not ensured the implementation of conduct of operations principles across the site. LANL lacked a clear policy and implementing procedures to effectively establish and communicate management's expectations on procedure use and adherence. The continued occurrence of incidents involving a failure to comply with procedures or the conduct of work without procedures presented a significant safety concern. In TA-55 and CMR facility management operations, many of the elements of conduct of operations were lacking or inadequately implemented. Further, TA-55 and CMR lacked the training, organizational structure, and personnel necessary to successfully implement

the new commitments regarding technical safety requirements and safety analysis reports.

Action Status

As a result of the "necessary and sufficient" closure process, DOE Order 5480.19 was not selected as a Work Smart standard. To introduce the required level of formality of operations into the Los Alamos safety requirement system, the philosophies and guidance of this order have been incorporated into three documents. The ISM system description, LAUR-998-2837, Rev.3, Section 5.5.3, sets a requirement for using the elements of DOE Order 5480.19 in facility safety plans. Laboratory Performance Requirement (LPR) 240-01-00.1, "Facility and Operating Limits and Configuration (Formality of Operations)," has been accepted as a Work Smart standard and includes a requirement to use the philosophies and guidance of DOE Order 5480.19. Laboratory Implementation Guidance (LIG) 240-01-10 on Facility Safety Plans (FSPs) indicates how the philosophies and guidance of DOE Order 5480.19 will be incorporated into FSPs.

FSPs were in place at all 20 Facility Management Units by the milestone date of December 24, 1998, and are in use. LAAO reviewed the implementation of FSPs in April 1999 and found that the requirement was "not implemented due to failure of FSPs to address Conduct of Operations philosophies and guidance per LPR 240-01-00.1." This deficiency has been corrected by modifying both the FSP LIG and the discussion of FSPs in the ISM description clarifying the connection to DOE Order 5480.19.

AL and LAAO report that corrective actions for this safety issue remain to be completed. FSPs that did not meet the clarified requirement for conduct of operations philosophies and guidance were scheduled to be revised before the end of 1999.

Electrical Safety Program

Accident investigations and the Office of Oversight safety management evaluation in 1996 found that LANL did not have a comprehensive sitewide electrical safety program and associated implementing procedures. There were no implementing procedures to describe how to use energized electrical work permits (EEWPs) and diagnostic and testing energized electrical circuits (DTEEC) forms, and EEWPs and DTEEC packages were found to be deficient. LANL management had not taken action to resolve conflicting requirements between the Director's stop-work memorandum and Laboratory Administrative Requirement (AR 7-1) on electrical safety.

Action Status

AL and LAAO report that corrective actions for this safety issue have been completed.

In the fall of 1996, LANL established an Electrical Safety Task Force to develop a comprehensive sitewide electrical program at LANL. As a result of that effort a new LIR for electrical safety, LIR 402-600-01.1, was issued on December 24, 1996; it was discussed and accepted by each of the division directors at LANL. The LIR included provisions to establish the Electrical Authority-Having-Jurisdiction (AHJ) for EEWPs, for qualification and training of electrical workers, and for evaluation of electrical work. It also established the Electrical Safety Committee.

Self-assessment reports were submitted to the Laboratory's Electrical Safety Committee on May 22, 1998. Special attention was given to the assessment and reporting of the status of the following items: 1) appointment of division or company Electrical Safety Officers and group Electrical Safety Officers; 2) training, education, and experience requirements for "qualified workers," validation of work they are qualified to do, and existence of worker training plans; 3) progress towards completion of identified training for electrical workers, authorizers, and

Electrical Safety Officers; 4) knowledge of electrical operations conducted by the organization, whether compelling reasons exist for performing work on energized systems, and the effectiveness of assessment, mitigation, and control of electrical work; and 5) whether standard operating procedures (SOPs) and safe electrical work practices (SEWPs) exist as required, are up-to-date, contain the required information, are reviewed by qualified workers, and are provided to the division Electrical Safety Officer.

The Laboratory's Electrical Safety Committee reviewed the self-assessment reports, reviewed samples of report conclusions for each line organization as necessary for validation, and reported their findings and conclusions regarding line electrical safety implementation to the Laboratory Director and to the Operations Working Group in June 1998.

As a result of the Committee's report, the Deputy Director issued a directive stating that only individuals with completed training could perform electrical work. In addition, a process was developed to identify maintenance work so that it could be inspected, and a procedure was developed to provide for the acceptance of electrical installations by the AHJ on new constructions. The Electrical Safety LIR was revised again in December 1998 to clarify the role of the AHJ and to clearly integrate electrical safety requirements into the Laboratory's work control and safe work practices processes.

Performance Assessment

The comprehensive safety management evaluation conducted by the Office of Oversight in 1996 found that, collectively, AL, LAAO, and LANL had a variety of assessment programs that were conducted with varying degrees of formality, rigor, and documentation. These programs did not provide a comprehensive assessment of LANL performance and were not coordinated to provide a sound basis for management decision-making. Self-assessment activities (e.g., management walkarounds,

independent internal assessments, occurrence reporting, self-assessments) were not linked or integrated to provide an effective database for: (1) corrective actions, (2) AL's performance assessment matrix (PAM) and (3) lessons-learned programs.

Action Status

AL and LAAO report that corrective actions for this safety issue have been completed.

The Laboratory assessment program continues to evolve to provide assurance that ES&H expectations are routinely reviewed and appropriately addressed. These expectations are principally located in Laboratory standards and Appendix F of the UC/Laboratory contract. Assessments are designed to ensure that ES&H expectations are routinely reviewed at the activity and facility levels through management walk-arounds, at the organizational level through quarterly line management assessments, and at the institutional level through semiannual Safety Function Manager assessments and internal independent assessments. Organizational and institutional self-assessments are based on a common set of standards and use existing assessment data collection systems as a means for determining the overall health of organizational and Laboratory ES&H programs.

To provide manageable areas for assessment, Laboratory standards are grouped into eight safety function areas (e.g., radiation protection, facility management, fire protection). The Laboratory Safety Function Managers and the Internal Independent Assessment group (AA-2) perform routine assessments of each of these safety functions. Performance data from occurrences, lessons learned, employee concerns, corrective actions from internal and external assessments, and walkarounds are also grouped into the eight safety functions to help provide input for organizational and institutional assessments. In addition to sharing common data and expectations, these assessments are

coordinated to minimize duplication. Institutional reports integrating all available assessment data are also routinely provided to senior management and periodic meetings with DOE are conducted to share assessment input and help minimize assessment overlap.

DOE program weaknesses identified in 1996 have been corrected by improving documented system descriptions and instructions to facility representatives (FRs) and subject matter experts (SMEs) on the conduct of ES&H oversight. Routine surveillance activities by FRs and SMEs from both LAAO and AL are the purview of the Area Office and are conducted in accordance with that office's instructions. The LAAO Office of Facility Operations has developed Standing Instructions that specify how assessments are to be performed and that define documentation requirements. "Facility Representative Program," October 28, 1997, provides guidance for the conduct of daily walk-through assessments, and "Contractor Appraisal," October 28, 1997, provides the requirements and methodology for planning, conducting, and documenting SME surveillance activities.

A formal ES&H appraisal is conducted once a year in accordance with the system description contained in the "AL Contractor Performance Appraisal Process." The scope of this appraisal is mutually determined by LAAO and AL and is influenced, in part, by information gathered during routine surveillance activities performed throughout the year. Information from this formal appraisal and other sources, such as external audits and inspections, as well as performance against specific contract performance measures, is used in a formal evaluation of performance under the contract.

While these interlocking processes are the subject of continuous improvement and update, the descriptions of routine ES&H oversight remedy the former problems of overlapping assessments, inconsistencies in approach, and rigor appropriate for the activity.

DOE Approval Process for Authorization Basis Documents

The 1996 Oversight evaluation found that the DOE line management process for the review and approval of authorization basis documents did not ensure that these safety documents were approved in a timely manner. The process did not provide clear and explicit expectations, well defined steps, or meaningful milestones. The lack of a clear authorization basis review process impacted the final approval of the TA-55 safety analysis report (SAR), completion of commitments in the draft safety evaluation report (SER) for the TA-55 SAR, and development of the CMR facility SAR. The TA-55 and CMR SARs required DP approval. In the absence of a DOE-approved upgraded authorization basis, TA-55 and CMR were using their old safety documents to govern operations. While worker safety is addressed through preliminary hazards assessments (PHAs), outdated SARs do not address worker safety with the rigor required by the current orders and do not provide an adequate baseline for the unreviewed safety question determination (USQD) process.

Action Status

AL has initiated several efforts to ensure that authorization basis (AB) documents are approved in a timelier manner. These efforts include organizational changes as well as addressing the structure and rigor of the review process. Rigorous review of AB documents is dependent on providing clear direction to an appropriate number of personnel with the needed operational knowledge and technical expertise. To this end, AL delegated approval authority for AB documentation to LAAO, where the operational knowledge resides. Additionally, LAAO has appointed a Senior Authorization Basis Manager and increased the area office AB staff fourfold since the 1996 assessment. LAAO also populates review teams with personnel from the Safety Analysis and Support Division (SASD) at AL as well as DOE resources available through the Technical Resource Group (TRG) and DP-45.

AB documents that have been approved since the 1996 Oversight assessment include the CMR basis for interim operation (BIO) and technical safety requirements (TSRs) in August 1998 and the TA-55 SAR and TSR in January 1999. Other 1998 approvals include the RAMROD SAR and TSR and the Appaloosa final SAR (FSAR) and TSR.

To ensure that AB review teams are provided clear direction, SASD has been tasked to develop a procedure to establish a structured process that includes well-defined steps and meaningful milestones. General DOE expectations for AB documentation are provided in existing DOE orders and standards. The procedure will require that review teams provide any additional expectations for a given AB development throughout the development process.

Sitewide Requirements Management Systems

AL, LAAO, and LANL had not instituted an integrated sitewide requirements management system at LANL. There were no institutional systems in place to ensure a traceable flow of applicable requirements and related information from the institutional level to the facility and activity levels, including subcontractors. In addition, LANL did not have a hierarchy of documents and an associated document control process by which the Laboratory communicates and controls ES&H requirements. LANL management did not identify interim actions while DOE and LANL revisited the Laboratory's implementation of the "Work Smart" initiative, which did not have the full endorsement of DOE.

Action Status

LANL used the "necessary and sufficient" closure process to develop a set of WSS, which was completed by DOE and LANL and was approved by the AL Manager on September 23, 1997. These standards were included in the October 1997 contract extension.

The WSS set is maintained by monthly meetings of the LAAO ESH managers, communications with LANL and UC, and formal change control by the ISM Change Control Board. The ISM Change Control Board has been given the authority to act as the Convened Group for changes to the WSS. The Change Control Board meets quarterly and recommends appropriate changes to the DOE and UC contracting officers. The WSS and other laws, regulations and requirements flow through the laboratory requirement system into the LIRs, which form the basis of hazard identification and control at the working level (LAUR-98-2837).

The institutional requirements system was overhauled into a new, hierarchical, three-tiered requirements system that includes:

- Laboratory Performance Requirements (LPRs) - LPRs establish the performance standards and criteria that all work at the Laboratory must meet. These documents only stipulate performance expectations; they do not direct how the results are to be achieved.
- Laboratory Implementing Requirements (LIRs) - LIRs identify what is institutionally required to implement the performance requirements contained in the LPRs. LIRs do not contain detailed procedural instructions, unless there is a process or procedure that must be implemented Laboratory-wide to meet the requirements.
- Laboratory Implementing Guidance (LIGs) - LIGs contain institutional-level guidance to be considered for meeting the expectations contained in LPRs or the requirements contained in LIRs.

The Office of Institutional Coordination was established; a system for review and approval of new policy implementation requirements and guidance was established; and a prioritization process was used to establish a sequence for issuing priority LPRs, LIRs, and LIGs.

AL and LAAO report that corrective actions for this safety issue remain to be completed. All actions have been completed except the implementation of LIRs that improve efficiency and eliminate redundancy, and the implementation of LIRs that are format conversions. These actions are scheduled for completion by December 2000.

RECENT SITE PERFORMANCE

Major Events

None.

Results of Recent Major Assessments

Oversight Follow-up Review of ISM at LANSCE

The Office of Oversight performed a follow-up review at LANL in October 1999 that focused on selected ISM initiatives as they are applied in Los Alamos Neutron Science Center (LANSCE) R&D activities. A similar review in January 1998 concluded that progress had been made but that additional work on the ISM efforts was needed to continue addressing several of the judgments of need identified in a 1996 Type A accident investigation of an electrical shock involving a LANSCE microwave experiment.

The LANL ISM initiatives are essential for addressing systemic issues that were identified in the 1996 microwave accident investigation. As part of the ISM efforts, LANL committed to implement safe work practices and FSP initiatives in 1999; these programs require LANL R&D activities to adopt a more formal and rigorous approach to safety.

The October 1999 follow-up review found that LANSCE management is committed to ISM implementation and has provided the necessary leadership to make significant progress in developing and implementing ISM over the past two years. The Oversight team concluded that LANSCE management has now adequately addressed all of the judgments of need resulting

from the microwave accident. LANSCE has made good progress since the 1998 Oversight review and has several initiatives in progress to further improve ES&H systems and fully implement ISM. While much work remains, LANSCE management has a good understanding of current weaknesses and has efforts in place to make the needed improvements. Continued management attention and leadership are needed to ensure that ongoing and planned actions are fully implemented and achieve their objectives. LANL has established fundamental systems to support the implementation of ISM across the Laboratory, but improvements are needed in some areas to fully apply these systems and to effectively implement key ISM initiatives, such as safe work practices and FSPs at the division level.

DOE ISM System Verification

As part of the ISM system verification effort, an LAEO team conducted milestone validations of selected ISM implementation plan commitments during the last quarter of FY 1999 in conjunction with the ES&H special assessment (see below). A Phase I and Phase II ISM verification was conducted in October 1999. A final report on the verification is pending, but indications are that Phase I will be implemented and Phase II is implemented except for two areas that will be reassessed in the summer of 2000. Also included in the verification effort was the determination of the status and the validation of closure of corrective actions addressing Office of Oversight safety issues.

DOE FY 1999 ES&H Special Assessment

An AL/LAEO team conducted the second special assessment at LANL in October 1999 to determine whether the overall level of performance achieved by UC/LANL was satisfactory with regard to the performance objectives and ES&H requirements of the UC/DOE contract. Seven subteams were formed to review the following functions/activities:

facility work control, FSPs, safe work practices, management commitment, implementation of the ISM system, the implementation of priority LIRs, and the use of ISM factors in managers' performance evaluations. Also, as part of the assessment, the status and closure of corrective actions addressing Office of Oversight safety issues were validated in conjunction with the DOE ISM system verification. The results of the assessment are expected to be reported in January 2000.

DNFSB Review of Electrical, Instrumentation and Control, and Fire Protection Systems

On September 22, 1999, based on observations by its staff members, the Board reported that the LANL WSS set does not address the design of safety-class or safety-significant electrical and instrumentation and control systems. The report also identified opportunities for improvement in a number of other areas, including design requirements for fire protection and lightning protection. The Board suggested that the LANL WSS set be upgraded to ensure compliance with established industry design practices for safety systems.

DNFSB Review of Worker Protection

The DNFSB staff reviewed various aspects of work control at LANL. In a July 26, 1999 letter report, the Board indicated that its staff found that improvements in developing controls for the protection of workers during R&D activities had been made or were under development as part of LANL's ISM initiatives. The Board suggested, however, that additional guidance for principal investigators and supervisors would be useful in improving work planning. The Board also felt that more thorough implementation of identified requirements was needed. The report concluded that observed deficiencies needed to be corrected to ensure that hazards are properly identified and analyzed, and that adequate controls are implemented so that R&D and facility work could be conducted more safely at the activity level.

Deficiencies in Work Controls and Radiological Monitoring

LANL received a Preliminary Notice of Violation from the DOE Office of Environment, Safety and Health on September 3, 1999, as a result of a series of deficiencies in work controls and in radiological monitoring. These deficiencies led to a worker's unplanned, uncontrolled radiological exposure and intake of radiological material (Am-241) at the CMR facility in November 1998. The Notice described violations that involved multiple failures to conduct approved work activities in accordance with established procedures and work controls, to adequately monitor for radioactive material, to post and control access to radiological areas, and to implement effective corrective actions.

New Mexico Environment Department Compliance Orders

In June 1998, the State of New Mexico issued three compliance orders to DOE and UC/LANL for waste management violations, with civil penalties totaling over \$1.6 million. One order covered three specific violations for failure to determine and verify hazardous waste releases, failure to identify migration pathways, and failure to identify actual or potential receptors and risks. Another order included two violations for unlawful storage of hazardous gas cylinders and failure to report such non-compliance. The third order involved four violations for failing to perform waste analyses related to land disposal, failing to prepare a manifest (and transporting waste without a manifest), offering hazardous waste for disposal to an unauthorized facility, and owning and operating unpermitted waste facilities. An investigation was also required regarding the circumstances of the disposal of chemically contaminated asphalt.

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Appendix A. Key Facility Summary

FACILITY NAME	MISSION/ STATUS	HAZARD CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN BASIS ACCIDENT	PRINCIPAL HAZARDS AND VULNERABILITIES
CMR at TA-3 (Chemistry and Metallurgy Research Facility)	Mission: Chemistry laboratories in support of DP stockpile management program, plutonium processing R&D; and uranium scrap recovery and conversion to oxides Status: Operational	Category (Cat) II facility; Safety basis - Approved Basis for Interim Operations (BIO), Sep 1998 w/11 conditions. BIO will transition to FSAR upon completion of CMR upgrades	Wing-wide fire and a seismically induced building collapse	Vulnerabilities: Not all systems meet standards or requirements. BIO contains identified deficiencies in the facility structure, electrical systems, ventilation systems, sanitary waste system, industrial waste system, cooling water system, telephone systems, monitoring devices and alarms, HVAC controls, and fire protection systems. Hazards: Chemicals, radiological, fires, explosions, spills, toxic and flammable gas generation.
LANSCE at TA-53 (Los Alamos Neutron Science Center)	Mission: High-intensity, multiple-use accelerator to serve a large community of scientists Status: Operational	Cat III activities, nonnuclear accelerator facility; Safety basis - BIOs for nuclear experiments have been submitted	Personnel exposure from undetected beam spill; tungsten target oxidation due to loss of coolant	Vulnerabilities: Exposure to radioactive material and gamma radiation, electrical, and other radiological hazards. Hazards: Electrical hazards (high-power, high radio frequency power systems, large capacitor banks, high-voltage systems, high-current electromagnet systems, and industrial type power substations and distribution lines to accommodate 25MW power load) and radiological hazards (from beam energy/intensity). LANSCE has limited access spaces considered confined spaces.
PF-4 at TA-55 (Plutonium Facility)	Mission: State-of-the-art plutonium processing Status: Operational	Cat II facility; Safety Basis - SAR/TSR approved 12/96; DOE SER issued 1/97; 1979 environmental impact statement (EIS)	Evaluation basis earthquake; nuclear criticality from excess fissile material; instantaneous rupture of vessels; fire in a glovebox	Vulnerabilities: Plutonium processing and handling, inadvertent transfers, aging of facility and equipment, organic nitric acid reactions, equipment failures, corrosion, inadequate configuration knowledge, inadequate seals, storage of material not in the design basis, and loss of operating experience. Hazards: Hazardous materials.
LACEF at TA-18 (Los Alamos Criticality Experiments Facility)	Mission: Design, construction, and research and development of critical experiments; teaching and training in criticality safety Status: Operational	Cat II facility; Safety basis - 4/92 SAR, SAR updated 5/17/96	SHEBA excursion; KIVA I failure; KIVA II fire; KIVA III melt; U/Pu dispersion from Vault	Vulnerabilities: Onsite storage mishaps, high electrical voltage, neutron decay outside the critical volume, fire, loss of AC power, external missile penetration, plutonium (Pu) excursion, uranium/plutonium (U/Pu) dispersion, tank breach, and fissile material vaporization. Hazards: Contaminated materials.
Radiochemistry and Hot Cell Facility at TA-48	Mission: Nuclear medical research; Medical Radioisotope Program Status: Operational	Cat III facility; Safety basis - Draft BIO sent to AL for second round of comments	Design basis accidents analyzed in draft BIO now under review	Vulnerabilities: Exposure to radioactive materials, wastes, and radiation from accelerator activated materials; radiochemistry operations, hot-cell work; use of lasers; cryogenic fluids; high voltages; suspended loads during hoisting and lifting; perchloric acid and other hazardous and toxic chemicals

Appendix A. Key Facility Summary (cont'd)

FACILITY NAME	MISSION/ STATUS	HAZARD CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN BASIS ACCIDENT	PRINCIPAL HAZARDS AND VULNERABILITIES
DARHT at TA-15 (Dual-Axis Radiographic Hydrodynamic Test Facility)	Mission: DARHT to assess safety, performance and reliability of nuclear weapons Status: Operational - First Axis Radiography and Firing Site Under construction - Second Axis	First Axis SAD, 12/98 with Rev 1, 4/99; and SER, 1/99 with Rev 1, 5/99. PrHA and SER for R312 Firing Site, 8/99. Under construction; Safety basis - Safety Assessment, 4/91; draft environmental impact statement, 5/91; final environmental impact statement, 8/95	Inadvertent detonation of test assembly	Vulnerabilities: Operational vulnerabilities and those associated with construction - hoisting, rigging, and lifting hazards with crane use. Hazards: Pollutants (nitrogen dioxide, nonmethane hydrocarbons, ammonia, nitric acid, hydrogen chloride, methyl alcohol, isopropyl alcohol, acetic acid, welding fumes, wood dust, nitrogen oxide, Stoddard solvent, and kerosene) and fire (insulating oil, wicking of insulating oil, acetone, ethanol, natural gas, trash accumulation, oil-soaked rags, volatile cleaning solvents).
RLWTF at TA-50 (Radioactive Liquid Waste Treatment Facility)	Mission: Characterize, treat, and dispose of radioactive liquid waste Status: Operational; process upgraded by addition of ultra-filtration, reverse osmosis units, electrodialysis, and mechanical evaporation units	Cat III facility; Safety basis - 11/88 SAR; 11/88 OSR; TA-50-1 SAR approved 11/22/95; Interim TSR approved 3/16/99	Loss of day tanks (20,000 gal) with release of chemicals and radioactivity (0.5 µg/l); TRU liquid waste tank release (1,000gal w/250g Pu-235).	Vulnerabilities: Exposure to radiation, radioactive materials, corrosive chemicals, solvents, asbestos insulation, high voltages, and hazardous compressed gases. Hazards: Sulfur dioxide, hydrogen cyanide, nitric acid, carbon dioxide, calcium carbonate, ferric hydroxide, hydrated lime, ferric sulfate, and commercial coagulant; waste streams contain Am-241, Pu-238 & 239, U-234, H-3, Sr-89 & 90, Cs-137, and liquid transuranic waste.
TSFF at TA-21 (Tritium Science and Fabrication Facility)	Mission: Neutron target tube loading; metal getter detritation; boost-gas and target development Status: Operational; salt synthesis shutdown	Cat II facility; Safety basis - 1987 Safety Assessment; upgraded SAR under AL review	Worker exposure to 10-100 Ci of tritium – equipment failure	Vulnerability: Exposure to plutonium sources; releases of tritium to air, water, and as solid waste. Hazard: Tritium.
TSTA at TA-21 (Tritium Systems Test Assembly)	Mission: Demonstration of fusion power fuel cycle; develop and test equipment for tritium service Status: Operational	Cat II facility; Safety basis - 1984 SAR; SAR approved as BIO 8/96	Worker exposure to 10-100 Ci of tritium – equipment failure	Vulnerabilities: Exposure to plutonium sources; normal operation of tritium facilities results in releases of tritium to air, water, and as solid waste. Hazard: Tritium.
WETF at TA-16 (Weapons Engineering Tritium Facility)	Mission: Tritium gas purification; mixing with other gases; analysis of gaseous tritium; and repackaging tritium and other gases to high pressures Status: Operational	Cat II facility; Safety basis - 4/95 SAR; OSR 5/95; upgraded SAR currently under AL review	Worker exposure to tritium from equipment failure	Vulnerabilities: Exposure to hydrogen isotopes, plutonium sources, uranium beds, hydrogen compounds and salts, compressed gases (He, N), solvents (ethanol, acetone). Hazards: Radioactive materials.